Radial profile of the storm-time convection electric field in the equatorial magnetosphere: THEMIS observations

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The radial profile of convection electric fields and its temporal evolution in the evening sector of the equatorial magnetosphere during a storm main phase is examined on the basis of the plasma and field data obtained by the THEMIS spacecraft constellation. Before the storm main phase started, the duskward component of the DC electric field was enhanced in both the inner magnetosphere (R ˜5 RE) and the tail plasma sheet of R farther than 10 RE upon a significant southward IMF. After the storm main phase started developing, the large (˜1-2 mV/m) duskward electric field persists in the inner magnetosphere until the spacecraft enters the electron plasma sheet region, while that in the tail plasma sheet is not as stable, but shows large fluctuations. As moving into the electron plasma sheet, the electric field still has a small but significant (˜0.1-0.3 mV/m) duskward component in the plasma sheet at R ˜6 RE, while that in the plasma sheet at R ˜10 RE shows no systematic duskward component, even though large duskward fields were observed at the same time in the mid-tail region (R ˜15 RE or farther). These simultaneous observations in the inner magnetosphere and the plasma sheet down the tail reveal that the temporal evolution of the storm-time convection electric field is not spatially coherent but differs for different regions; a characteristic structure of the convection electric fields associated with different particle regimes develops in the inner magnetosphere during storm times.